

Amendments to the Claims:

This listing of claims replaces all prior versions and listings of claims in the application:

Listing of Claims:

1. (Previously presented): An electrical apparatus comprising:  
two terminals accessible from an exterior of the electrical apparatus;  
an electrical element comprising a monolithic MOV disk having an outer surface and two ends, the ends being in contact with the two terminals, the monolithic MOV disk having a rating of at least 6 kV; and  
a reinforcing structure attached to the outer surface and constructed so as to enable the monolithic MOV disk to withstand at least one 100 kA impulse without cracking, wherein the reinforcing structure comprises a fiber matrix pre-impregnated with a resin, the fiber matrix comprising a pre-woven fabric.
2. (Cancelled).
3. (Original): The apparatus of claim 1 wherein the monolithic MOV disk has a rating between approximately 6 kV and approximately 800 kV.
4. (Cancelled).
5. (Previously presented): The apparatus of claim 1 wherein the fibers in the fiber matrix are oriented in a predetermined orientation with respect to an axis of the electrical element.
6. (Previously presented): The apparatus of claim 5 wherein the fibers in the fiber matrix are oriented parallel to the axis.

7. (Previously presented): The apparatus of claim 94 wherein the fibers segments are oriented in a random orientation.

8. (Original): The apparatus of claim 1 wherein the fibers in the fiber matrix are of a uniform length.

9. (Previously presented): The apparatus of claim 1 wherein the fibers in the fiber matrix are of a non-uniform length.

10. (Original): The apparatus of claim 1 wherein the fibers in the fiber matrix comprise fiberglass.

11. (Original): The apparatus of claim 1 wherein the fibers in the fiber matrix comprise a non-conductive material.

12. (Original): The apparatus of claim 1 wherein the fiber matrix is applied circumferentially.

13. (Previously presented): The apparatus of claim 12 wherein the fiber matrix is applied circumferentially such that the fibers have a predetermined orientation at a predetermined angle with respect to an axis of the electrical element.

14. (Original): The apparatus of claim 13 wherein the predetermined angle is an angle less than approximately 50 degrees.

15. (Original): The apparatus of claim 14 wherein the angle is between approximately 3 degrees and approximately 10 degrees.

16. (Original): The apparatus of claim 12 wherein the circumferentially applied fiber matrix has a predetermined thickness.

17. (Previously presented): The apparatus of claim 1 wherein the fiber matrix is applied vertically.

18. (Original): The apparatus of claim 17 wherein the vertical application comprises at least one piece of fiber matrix placed in a vertical orientation along an axis of the electrical element.

19. (Original): The apparatus of claim 17 wherein the vertical application comprises a single piece of fiber matrix placed in a vertical orientation along an axis of the electrical element and having a sufficient width to cover the majority of an outer surface of the electrical element.

20. (Original): The apparatus of claim 1 wherein the reinforcing structure further comprises at least one layer of pre-impregnated fiber matrix applied circumferentially and at least one layer of pre-impregnated fiber matrix applied vertically.

21. (Cancelled).

22. (Previously presented): An electrical apparatus comprising:  
an electrical element comprising a bonded disk stack having an outer surface, the bonded disk stack comprising two or more MOV disks, each disk having a face-to-face bond with each adjacent disk, the bonded disk stack having a rating of at least 6 kV; and  
a reinforcing structure attached to the outer surface and constructed so as to enable the bonded disk stack to withstand at least one 100 kA impulse without breaking the face-to-face bonds, wherein the reinforcing structure comprises a fiber matrix pre-impregnated with a resin, the fiber matrix comprising a pre-woven fabric.

23. (Previously presented): The apparatus of claim 22 wherein the bonded disk stack comprises more than two MOV disks.

24. (Original): The apparatus of claim 22 wherein the fibers in the fiber matrix comprise a non-conductive material.

25. (Original): The apparatus of claim 22 wherein the fiber matrix is applied circumferentially.

26. (Previously presented): The apparatus of claim 22 wherein the fiber matrix is applied vertically.

27. (Original): The apparatus of claim 22 wherein the reinforcing structure comprises at least one layer of pre-impregnated fiber matrix applied circumferentially and at least one layer of pre-impregnated fiber matrix applied vertically.

28. (Withdrawn): A method of reinforcing an electrical apparatus, the method comprising:

providing at least one electrical element comprising a monolithic MOV disk having an outer surface and two ends, each end being in contact with a terminal accessible from an exterior of the electrical apparatus;

preparing a reinforcing layer for application to the outer surface of the electrical element, wherein the reinforcing layer comprises a fiber matrix pre-impregnated with resin; and

applying the reinforcing layer to at least a portion of the outer surface of the at least one electrical element.

29. (Withdrawn): The method of claim 28 wherein the monolithic MOV disk has a rating greater than 6 kV.

30. (Withdrawn): The method of claim 28 wherein the monolithic MOV disk has a rating between approximately 6 kV and approximately 800 kV.

31. (Withdrawn): The method of claim 28 wherein the electrical apparatus is constructed so as to withstand at least one 100 kA impulse.

32. (Withdrawn): The method of claim 28 wherein applying the reinforcing layer comprises circumferentially applying a pre-impregnated fiber matrix.

33. (Withdrawn): The method of claim 28 wherein applying the reinforcing layer comprises vertically applying a pre-impregnated fiber matrix.

34. (Withdrawn): The method of claim 28 further comprising performing post application processing of the reinforcing layer.

35. (Withdrawn): The method of claim 34 wherein performing post application processing comprises curing.

36. (Withdrawn): The method of claim 28 further comprising heating the element.

37. (Withdrawn): The method of claim 36 wherein the element is heated between approximately 100° F and 200° F.

38. (Withdrawn): The method of claim 35 wherein curing the reinforcing layer comprises heating the reinforcing layer.

39. (Withdrawn): The method of claim 38 wherein the reinforced layer is heated to between approximately 250° F and 400° F.

40. (Withdrawn): A method of reinforcing an electrical apparatus, the method comprising:

providing at least one electrical element comprising a bonded disk stack having an outer surface;

preparing a reinforcing layer for application to the outer surface of the electrical element, wherein the reinforcing layer comprises a fiber matrix pre-impregnated with resin; and  
applying the reinforcing layer to at least a portion of the outer surface of the at least one electrical element.

41. (Withdrawn): The method of claim 40 wherein applying the reinforcing layer comprises circumferentially applying a pre-impregnated fiber matrix.

42. (Withdrawn): The method of claim 40 wherein applying the reinforcing layer comprises vertically applying a pre-impregnated fiber matrix.

43. (Withdrawn): The method of claim 40 further comprising performing post application processing of the reinforcing layer.

44. (Withdrawn): The method of claim 40 wherein performing post application processing comprises curing.

45. (Withdrawn): A method of reinforcing an electrical apparatus, the method comprising:

providing at least one electrical element comprising a monolithic MOV disk having an outer surface and two ends, each end being in contact with a terminal that is accessible from an exterior of the electrical apparatus;

preparing a reinforcing layer for application to the outer surface of the electrical element, wherein the reinforcing layer comprises a fiber matrix having a mixture of fiber segments pre-impregnated with resin; and

applying the reinforcing layer to at least a portion of the outer surface of the at least one electrical element.

46. (Withdrawn): The method of claim 45 wherein applying the reinforcing layer comprises coating the element by dipping the element in the mixture of fiber segments and resin.

47. (Withdrawn): The method of claim 45 wherein applying the reinforcing layer comprises coating the element by casting in a pre-impregnated fiber matrix.

48. (Withdrawn): The method of claim 45 wherein applying the reinforcing layer comprises coating the element by powder coating in a fiber matrix.

49. (Withdrawn): The method of claim 45 wherein applying the reinforcing layer comprises coating the element in a fiber matrix.

50. (Withdrawn): A method of reinforcing an electrical apparatus, the method comprising:

providing at least one electrical element comprising a bonded disk stack having an outer surface;

preparing a reinforcing layer for application to the outer surface of the electrical element, wherein the reinforcing layer comprises a fiber matrix having a mixture of fiber segments pre-impregnated with resin; and

applying the reinforcing layer to at least a portion of the outer surface of the at least one electrical element.

51. (Withdrawn): The method of claim 50 wherein applying the reinforcing layer comprises coating the element by dipping the element in the mixture of fiber segments and resin.

52. (Withdrawn): The method of claim 50 wherein applying the reinforcing layer comprises coating the element by casting in a pre-impregnated fiber matrix.

53. (Withdrawn): The method of claim 50 wherein applying the reinforcing layer comprises coating the element by powder coating in a fiber matrix.

54. (Withdrawn): The method of claim 50 wherein applying the reinforcing layer comprises coating the element in a fiber matrix.

55. (Previously presented): The apparatus of claim 1 wherein the reinforcing structure has a uniform thickness.

56. (Previously presented): The apparatus of claim 1 wherein the reinforcing structure is configured to reinforce a selected portion of an area of the monolithic MOV disk along a lengthwise axis of the disk.

57. (Previously presented): The apparatus of claim 56 wherein the selected portion of the area comprises less than all of the area.

58. (Previously presented): The apparatus of claim 56 wherein the selected portion of the area comprises an area excluding the ends of the monolithic MOV disk.

59. (Previously presented): The apparatus of claim 56 wherein the selected portion of the area comprises an area including a center of the monolithic MOV disk.

60. (Previously presented): The apparatus of claim 5 wherein the predetermined orientation is based upon the orientation of the fabric with respect to the axis.

61. (Previously presented): The apparatus of claim 5 wherein the predetermined orientation is based upon a woven pattern of the fibers in the pre-woven fabric.

62. (Previously presented): The apparatus of claim 5 wherein the predetermined orientation comprises one of approximately zero degrees and approximately ninety degrees with respect to the axis.



63. (Previously presented): The apparatus of claim 13 wherein the predetermined angle is based upon the angle of the fabric with respect to the axis.

64. (Previously presented): The apparatus of claim 13 wherein the predetermined angle is based upon a woven pattern of the fibers in the pre-woven fabric.

65. (Previously presented): The apparatus of claim 13 wherein the predetermined angle comprises one of approximately zero degrees and approximately ninety degrees with respect to the axis.

66. (Previously presented): The apparatus of claim 22 wherein the bonded disk stack has a rating between approximately 6 kV and approximately 800 kV.

67. (Previously presented): The apparatus of claim 22 wherein the electrical apparatus is constructed so as to withstand at least one 100 kA impulse.

68. (Previously presented): The apparatus of claim 22 wherein the fibers in the fiber matrix are oriented in a predetermined orientation with respect to an axis of the electrical element.

69. (Previously presented): The apparatus of claim 68 wherein the predetermined orientation is based upon the orientation of the fabric with respect to the axis.

70. (Previously presented): The apparatus of claim 68 wherein the predetermined orientation is based upon a woven pattern of the fibers in the pre-woven fabric.

71. (Previously presented): The apparatus of claim 68 wherein the predetermined orientation comprises one of approximately zero degrees and approximately ninety degrees with respect to the axis.

72. (Previously presented): The apparatus of claim 68 wherein the fibers in the fiber matrix are oriented parallel to the axis.

73. (Previously presented): The apparatus of claim 22 wherein the fibers in the fiber matrix are of a uniform length.

74. (Previously presented): The apparatus of claim 22 wherein the fibers in the fiber matrix are of a non-uniform length.

75. (Previously presented): The apparatus of claim 22 wherein the fibers in the fiber matrix comprise fiberglass.

76. (Previously presented): The apparatus of claim 22 wherein the fibers in the fiber matrix comprise a non-conductive material.

77. (Previously presented): The apparatus of claim 22 wherein the fiber matrix is applied circumferentially.

78. (Previously presented): The apparatus of claim 77 wherein the fiber matrix is applied circumferentially such that the fibers have a predetermined orientation at a predetermined angle with respect to an axis of the electrical element.

79. (Previously presented): The apparatus of claim 78 wherein the predetermined angle is based upon the angle of the fabric with respect to the axis.

80. (Previously presented): The apparatus of claim 78 wherein the predetermined angle is based upon a woven pattern of the fibers in the pre-woven fabric.

81. (Previously presented): The apparatus of claim 78 wherein the predetermined angle comprises one of approximately zero degrees and approximately ninety degrees with respect to the axis.

82. (Previously presented): The apparatus of claim 78 wherein the predetermined angle is an angle less than approximately 50 degrees.

83. (Previously presented): The apparatus of claim 82 wherein the angle is between approximately 3 degrees and approximately 10 degrees.

84. (Previously presented): The apparatus of claim 77 wherein the circumferentially applied fiber matrix has a predetermined thickness.

85. (Previously presented): The apparatus of claim 22 wherein the fiber matrix is applied vertically.

86. (Previously presented): The apparatus of claim 85 wherein the vertical application comprises at least one piece of fiber matrix placed in a vertical orientation along an axis of the electrical element.

87. (Previously presented): The apparatus of claim 85 wherein the vertical application comprises a single piece of fiber matrix placed in a vertical orientation along an axis of the electrical element and having a sufficient width to cover the majority of an outer surface of the electrical element.

88. (Previously presented): The apparatus of claim 22 wherein the reinforcing structure further comprises at least one layer of pre-impregnated fiber matrix applied circumferentially and at least one layer of pre-impregnated fiber matrix applied vertically.

89. (Previously presented): The apparatus of claim 22 wherein the reinforcing structure has a uniform thickness.

90. (Previously presented): The apparatus of claim 22 wherein the reinforcing structure is configured to reinforce a selected portion of an area of the bonded disk stack along a lengthwise axis of the bonded disk stack.

91. (Previously presented): The apparatus of claim 90 wherein the selected portion of the area comprises less than all of the area.

92. (Previously presented): The apparatus of claim 90 wherein the selected portion of the area comprises an area excluding the ends of the bonded disk stack.

93. (Previously presented): The apparatus of claim 90 wherein the selected portion of the area comprises an area including a center of the bonded disk stack.

94. (Previously presented): An electrical apparatus comprising:  
two terminals accessible from an exterior of the electrical apparatus;  
an electrical element comprising a monolithic MOV disk having an outer surface and two ends, the ends being in contact with the two terminals, the monolithic MOV disk having a rating of at least 6 kV; and

a reinforcing structure attached to the outer surface and constructed so as to enable the monolithic MOV disk to withstand at least one 100 kA impulse without cracking, wherein the reinforcing structure comprises a resin composition system of discontinuous fibers randomly dispersed in an epoxy.

95. (Previously presented): An electrical apparatus comprising:  
an electrical element comprising a bonded disk stack having an outer surface, the bonded disk stack comprising two or more MOV disks, each disk having a face-to-face bond with each adjacent disk, the bonded disk stack having a rating of at least 6 kV; and

a reinforcing structure attached to the outer surface and constructed so as to enable the disk stack to withstand at least one 100 kA impulse without breaking the face-to-face bonds, wherein the reinforcing structure comprises a resin composition system of discontinuous fibers randomly dispersed in an epoxy.

96. (Previously presented): The apparatus of claim 95 wherein the fibers are oriented in an arbitrary orientation.

97. (Previously presented): The apparatus of claim 1 wherein the monolithic MOV disk has a rating greater than 6 kV.

98. (Previously presented): The apparatus of claim 97 wherein the monolithic MOV has a rating of 9 kV.

99. (Previously presented): The apparatus of claim 22 wherein the bonded disk stack has a rating greater than 6 kV.

100. (Previously presented): The apparatus of claim 99 wherein the bonded disk stack has a rating of 9 kV.

101. (Previously presented): The apparatus of claim 94 wherein the monolithic MOV disk has a rating greater than 6 kV.

102. (Previously presented): The apparatus of claim 101 wherein the monolithic MOV has a rating of 9 kV.

103. (Previously presented): The apparatus of claim 95 wherein the bonded disk stack has a rating greater than 6 kV.

104. (Previously presented): The apparatus of claim 103 wherein the bonded disk stack has a rating of 9 kV.

105. (New) The apparatus of claim 95, wherein the bond between adjacent MOV disks has a first Young's module and each MOV disk has a second Young's modulus that is at least twice as great as the first Young's modulus.

106. (New) The apparatus of claim 95, wherein the second Young's modulus is at least ten times greater than the first Young's modulus.